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SOURCE Ugol'.MINING THICK COAL SEAMS IN THE USSR

[Numbers in parentheses refer to appended sources.]

Problems Encountered in the Chelyabinsk Basin

The Chelyabinsk coal basin is a large supplier of fuel coal for the industry and electric power stations of the Urals. Chelyabinsk coals are highly coalified lignite, in some respects fairly close to bituminous coals (for example, in the carbon content, often totaling 72-74 percent of the organic mass). Not being hard, they possess considerable viscosity and have a high moisture and ash content. However, the calorific value of these coals is high, sometimes as high as 7,500 calories, and this makes them, after suitable cleaning, completely satisfactory fuel coals.

More than 60 percent of the coal reserves in the Chelyabinsk basin lie in thick seams, in about 40 percent of cases more than 6 meters thick. The tendency of the coal to spontaneous combustion has complicated the working of the seams and this problem has increased in urgency as operations in many mines (up to 70 percent) in the area have been transferred to deeper levels.

The seams, particularly the thick ones, have many rocky interlayers (sometimes as many as 39). The cleavage in the coal is usually distinct and extends largely along the strike or at a slight angle to it.

In recent years liberation of gas has been observed in a number of seams, in connection with the transfer to deeper horizons. Coal dust is almost never formed because of the moisture of the coal.

The characteristics of the Chelyabinsk basin are as follows:

1. The presence of thick seams, for example, four seams of the Yemanzhelinka deposit (I-Moshchnyy, I-Prim, III, II) totaling more than 86 meters and being in the proportion of about two to one to the thickness of all other seams being worked.

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2. Coal beds in the form of synclinal folds at a comparatively slight depth.
3. Considerable disturbances in the seams both with and without breaks in their continuity (usually a disturbance of some kind every 150-200 meters along the strike).
4. Structure of seams complicated by large number of rocky interlayers.
5. Tendency of the coal toward spontaneous combustion.
6. Instability of the wall rock, consisting with few exceptions, of argillites, siltstones, and carbonaceous shales. The roof of the seams allows for only a small area of exposure from one to 5-7 square meters in the worked-out area. The roof collapses immediately after the removal of props. After the collapse, the roof rock, being soft, packs well.

In 1907 coal mining was started in the coal seams of the Chelyabinsk basin (along seam I-v, in the region of the so-called Tugaykul'skiy anticline, 18 kilometers east of the city of Chelyabinsk). Thick seams were worked by the open-pit method up to 1932 in the region of Kopeysk and up to 1934 in the region of Yemanzhelinka. In 1934 the seams were worked for the first time by slicing methods. Up to this time several variations of the short-pillar method had been employed in almost all mines.

During the past 18 years, considerable experience has been accumulated on working thick seams by diagonal slicing, both with caving of the roof and with backfilling of the worked-out area by gravity. One of the best examples is the working of I-Moshchnyy seam (Mine No 18-bis of the Yemanzhelinugol' Trust, at a level of 70 meters) which is 60 meters thick and has an angle of dip of up to 85 degrees. This seam was worked by 16 slices with backfilling of the worked-out area by gravity. A layer up to 40 meters thick was removed. Now at a level of 130 meters work has been started on the same seam where it is 25-30 meters thick and the angle of dip is up to 65 degrees. Seam I-Prim, up to 30 meters thick, and with an angle of dip of up to 45 degrees, is also being worked in Mine No 18-Naklonnaya of the same trust.

The most efficient method of fire prevention has proved to be the central transmission of fire-extinguishing substances through group wells and pulp pipes. The number of fires from spontaneous combustion of coal has decreased sharply in recent years--for example, in 1946, for every million tons of coal extracted by diagonal slicing, 5.4 fires were registered while, in 1951, this figure was reduced to 2.6 fires.

From 1946 through 1951 technical and economic indexes improved considerably in working by the diagonal slicing method with roof caving, as is shown in the following table:

	<u>1946</u>	<u>1951</u>
Productivity of face, tons per month	3,400	5,634
Advance of face, meters per month	13.6	19.3
Coal yield in development work, percent	14.5	6.6
Losses of coal, percent	12.0	8.9
Labor productivity per worker at face, tons	1.90	4.0
Consumption of timber per 1,000 tons of output, cubic meters	59.4	51.7

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At present, almost 70 percent of all exploitational sections of the basin are being worked by this system. During 1951, the coal mined by diagonal slicing was distributed as follows with reference to the number of simultaneously removed slices: 42 percent was extracted from seams being worked by two diagonal slices and 58 percent from seams being worked by three or more slices.

The distribution of faces according to methods of roof control as of 1 July 1952 was as follows:

<u>Method of Roof Control</u>	<u>No of Faces</u>	<u>Percent of Total No of Faces</u>
Complete caving	72	96
Complete backfilling by gravity	3	4
Total	75	100

The chief method of roof control in the Chelyabinsk basin for slightly dipping, dipping, and steeply dipping seams is complete caving.(1)

Experience of the Krasnobrodskiy Coal Pit in the Kuzbass

The Krasnobrodsk coal deposit is located in Kiselevskiy Rayon of Kemerovskaya Oblast. The geological structure of the rayon consists of rocks of the Middle Devonian, Lower Carboniferous, and softer Quarternary deposits, made up of yellow-brown, sandy, argillaceous soils. The thickness of the friable Quarternary deposits ranges from 0.5 to 15 meters.

Several coal seams are to be found in one section of the Krasnobrodsk pit. The thickest of them is being worked by the open-pit method. This is the steeply dipping Gorelyy seam, the normal thickness of which ranges from 22-30 meters, but, in some places, goes as high as 48-50 meters. The angle of dip of the seam is 65-85 degrees and the coal is type PS (parovichno-spekayushchiysya, steam caking).

The slight thickness of the overburden (0.5-5 meters) and the absence of a belt of oxidized coal have created favorable conditions for working the Gorelyy seam by the open-pit method.

The loading of the coal was carried out with the aid of a power shovel with a bucket capacity of 1.4 cubic meters. The width of the face permitted the simultaneous loading of two dump trucks. In some cases where the width of the face along the coal reached 50 meters, a second diesel excavator was placed at the face and then four dump trucks were loaded at the same time. On certain days, up to 3,000-3,500 tons of coal were moved from the faces by motor transport.

The main Krasnobrodsk pit was put into operation in February 1952. In this a synclinal fold of the Gorelyy seam was opened up at levels of + 327 and + 317 meters. The transport of overburden in the main pit is carried out with the aid of railroad transport using dump cars with a capacity of 22.6 cubic meters, made by the Kaliningrad Plant, and drawn by series E steam locomotives.

The coal is transported in MPS railroad cars loaded directly in the pit. Part of the output from temporary section 3 is moved by dump trucks to the western edge of the main pit at the + 327 meter level from which point the coal is dropped by gravity to the + 317 meter level, where it is loaded by excavator into MPS cars. This has decreased the distance in the transport of coal from the temporary section and has reduced transport costs.

Rock is moved by SE-3 and ESh-1 excavators to the dumps which receive as much as 5,000-6,000 cubic meters per day.

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Working the Gorelyy seam by the open-pit method assures higher labor productivity, lower ash content of the coal, and a low production cost per ton of coal mined, as shown in the following table (2):

	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1952 (6 mo)</u>
Average daily productivity, tons	330	640	1,193	1,772	2,248
Average daily amount of overburden removed, cubic meters	271	395	868	1,197	3,512
Labor productivity per exploitation worker, tons	49.2	145.9	171.3	208.2	218.1
Labor productivity per worker, tons	42.8	115.6	131.6	165.7	173.3
Ash content of coal, percent	8.55	8.15	7.34	7.16	7.10
Production costs, percent	100.0	56.1	37.9	26.5	23.9

SOURCES

1. Ugol', No 1, Jan 53
2. Ibid., No 2, Feb 53

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